VAPOR IMPERMEABLE POUR SPOUT CARTON

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] This application is a continuation-in-part of U.S. patent application Ser. No. 10/253,367, filed on September 24, 2002 which claims benefit to U.S. provisional application Ser. No. 60/324,385, filed on September 24, 2001.

STATEMENT OF FEDERALLY SPONSORED RESEARCH OR DEVELOPMENT

[0002] Not applicable.

FIELD OF THE INVENTION

[0003] This invention relates to cartons with pour spouts of the type that are typically used for containing and dispensing dry, granulated pourable product such as powdered soap, powdered milk, rice, cereal and like materials.

BACKGROUND OF THE INVENTION

[0004] Paper and paperboard are used extensively in the packaging industry to wrap, contain and enclose products and merchandise. For instance, double-faced Kraft paper corrugated boxes are often used as the outer shell in multi-unit shipments, for example, of textiles, electronics or non-perishable foodstuffs. Boxboard is often used for per unit packaging of various products, examples in the food industry being cereal boxes, beverage carriers and milk cartons.

[0005] Paperboard can be sufficiently strong and durable to meet a wide variety of packaging needs. In addition to strength, however, there are two other important considerations when using paperboard packaging, namely, printability and impermeability. Recyclability is another increasingly important factor to consider.

[0006] Product marketing and promotion dictate that the packaging be visually appealing, often with colorful text and graphics printed on the outside of the packaging. Untreated paperboard is typically a drab gray or brown color and

can have variations in the exposed surface. The color and the surface variations diminish the sharpness of the printed image and the vibrancy of its colors. Typically, to improve the printability of the package, the paperboard is bleached white. However, bleach can decrease the strength of the fibers in the paperboard and so usually a second layer of paperboard is added. Another very common technique is to apply a clay-based coating to the exterior surface of the paperboard. The clay is smooth and consistent typographically and comes in various colors, however, if it is applied in thick coats it is susceptible to cracking.

[0007] As mentioned, not only does the packaging need to meet marketing considerations, but depending on the product, it may also need to be generally vapor impermeable. This is a particular concern when the packaging contains granulated dry goods, such as dried milk, coffee, powdered soap and the like. Moisture from the ambient air can permeate the packaging, and depending on the product, cause clumping, spoiling and overall diminishing of the product appeal and effectiveness. "Moisture vapor transmission rate" ("MVTR"), also known by the "water vapor transmission rate", is a unitless measurement describing a package's passivity to moisture vapor over a specified time period, at a given temperature and pressure. An MVTR at or below 1.0 is considered very low and is desirable for granulated dry goods.

[0008] Common approaches for providing a moisture barrier to the paperboard include applying a metallized film or plastic laminate to the outer surface of the paperboard. However, the laminates and films may hinder printability and recyclability and their application to the exterior of the container does not eliminate migration to and from the fibers of the container walls, and thus is less than optimal. Moreover, the application of laminates and films generally entail relatively high manufacturing costs. Spray-on coatings, for example polymer based compositions, are also used. These coatings are typically transparent and less expensive to apply.

[0009] Another consideration for the packaging of certain products, such as granulated dry goods is the opening for accessing the goods. Closeable pour

spouts are commonly used in paperboard cartons and containers as a controlled way of emptying the contents of the cartons. The pour spout itself can be of a different material, such as metal or plastic, although paperboard pour spouts are also used. The pour spout is usually covered by an outer foil or other vapor impermeable layer before use. Once that outer layer is penetrated, the spout itself closes off the opening.

SUMMARY OF THE INVENTION

[0010] The present invention provides a carton with a pivoting pour spout formed of a paperboard sheet folded and glued to define walls of the carton having interior and exterior surfaces and defining a cavity for containing carton contents. The pour spout is cut into one of the walls and movable from a closed position to an open position in which the carton contents can be expelled through the pour spout.

[0011] As mentioned, the carton and pour spout are constructed of a paperboard material which is broadly defined herein to be a web of cellulosic fibers arranged in sheet form, including for example boxboard and container board, in corrugated or uncorrugated, recycled, bleached or unbleached form. The one-piece paperboard construction makes for an inexpensive and recyclable carton that can be hand or machine cut, scored, folded and otherwise assembled using known assembly equipment and processes. The pour spout can be formed at the upper end of a short side of the carton for easy pouring.

[0012] In one preferred form, the carton has inner and outer walls and the pour spout has inner and outer layers each hinged to the associated carton wall along essentially aligned fold lines allowing the pour spout to pivot thereabout between the open and closed positions. When closed, the spout outer layer and the outer wall are essentially coplanar and the spout inner layer and the inner wall abut in edgewise relation at a location between the fold lines and an end of the spout outer layer opposite the fold lines, for example, an upper end of the spout. More preferably, both of the spout layers are essentially coplanar with

the associated walls of the carton when the pour spout is closed. This construction thus forms a tight labyrinth seal which requires air, vapor or container contents to pass around a ninety degree path to enter or escape from the container.

[0013] In another preferred form, at least one side of the outer spout layer has cuts offset from one another and only partially through the material thickness of the outer spout layer. This holds the spout closed until it is first opened, and provides a tamper evident seal. The inner spout layer includes flaps folded inwardly from a center panel of the inner spout layer which is laminated to the outer spout layer. The flaps extend into the interior of the container and form the sides of the spout when it is open. At least one of the flaps can have a hold-open notch, a hold-closed notch or both formed in it.

[0014] In an even more preferred form, the interior surfaces of the carton walls are coated with a vapor impermeable coating. Coating the interior walls of the carton provides a vapor barrier nearest to the carton contents so as to virtually eliminate air migration between the fibers of the carton walls. The vapor impermeable coating is preferably a water-dispersible polymer, such as a suitable polyester resin, for example polyethylene terephthalate ("PET"). In the case of the carton contents being foodstuffs, the vapor impermeable coating should meet the Federal Drug Administration ("FDA") standards for direct contact with the foodstuffs. The exterior surfaces of the carton can also be laminated or clay coated to achieve a uniform color and finish able to accept printing with minimal distortion. The coated carton walls preferably exhibit an MVTR of at or near 1.0, and preferably less than one. The MVTR is affected primarily by the vapor impermeable coating as well as any other coating, film or foil layers of the carton.

[0015] The foregoing and other objects and advantages of the invention will appear in the detailed description which follows. In the description, reference is made to the accompanying drawings which illustrate preferred embodiments of the invention.

BRIEF DESCRIPTION OF THE DRAWINGS

[0016] FIG. 1 is a perspective view of a vapor impermeable coated paperboard carton with a pour spout according to the present invention;

[0017] FIG. 2 is detail view of the spout of FIG. 1;

[0018] FIG. 3 is a plan view of the unfolded blank for making the paperboard carton of FIG. 1;

[0019] FIG. 4 is a partial cross-sectional view taken along line 4-4 of FIG. 1 showing the pour spout when closed;

[0020] FIG. 5 is a partial cross-sectional view taken along line 5-5 of FIG. 2 showing the pour spout when opened;

[0021] FIG. 6 is a partial cross-sectional view taken along line 6-6 of FIG. 1 showing the pour spout when closed, and showing the pour spout in phantom lines when opened;

[0022] FIG. 7 is a partial cross-sectional view taken along line 7-7 of FIG. 3;

[0023] FIG. 8 is a view like FIG. 4 but showing an embodiment with an exterior barrier layer; and

[0024] FIG. 9 is a plan view of the unfolded blank for making an alternate paperboard container having a pour spout centered on an end wall.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0025] Referring particularly to FIGS. 1 and 3, a carton 10 of the invention is folded from a cut and scored one piece paperboard sheet blank 12. As mentioned above, the paperboard material is any web of cellulosic fibers arranged in sheet form, including for example boxboard and container board, in corrugated or uncorrugated, recycled, bleached or unbleached form.

[0026] The carton 10 and blank 12 have panels 14, 16, 18, 20 and 24 which define the side walls, by panels 16 and 20, and the end walls, by panel 18 and overlapping panels 14 and 24 at opposite ends of the blank, at the ends of the carton 10. As shown in FIG. 3, each panel 14, 16, 18, 20 and 24 has

respective end flaps 26, 28, 30, 32 and 34 at its opposite ends and which overlap flaps of the other panels.

[0027] When folded, end panel 24 overlaps end panel 14, with glue areas 36 illustrated in FIG. 3 on the outside of panel 14 (inside of panel 24) laminating the two panels together. The flaps 26, 30 and 34 of the end walls are folded beneath the flaps 28, with the flaps 26 outside of the flaps 34, and the flaps 32 are folded down on top of the flaps 28 and adhered to the flaps 28.

[0028] At the end wall of the carton 10 that has the pour spout 40 formed in it, the end wall is formed by both end panels 14 and 24. End panel 14 is the inside panel and end panel 24 is the outside panel. Each panel 14 and 24 has a spout layer cut into it, the inner spout layer formed in panel 14 being identified by 42, and the outer spout layer 44 being cut into panel 24. Inner spout layer 42 has a center or main panel 46 and side panels 48 and 50 attached to the sides of the center panel 46 by a fold line 51 or 53 at the corner joint between the center panel 46 and the respective side 48 or side 50. Center panel 46 is also joined at its base to the remainder of panel 14 by a fold line 52. Fold line 52 is in registration with fold line 54 which joins the base of outer spout layer 44 to the remainder of the panel 24.

[0029] The spout and container form a labyrinth seal which requires air, moisture or the contents of the carton to travel through a bend of approximately 90° to pass between the pour spout 40 and the end panels 14 and 24, thus providing a significant physical barrier between the container contents and the outside. In particular, as can be seen in FIG. 4, when the spout 40 is closed the central panel 46 of the inner spout layer 42 is substantially coplanar with the panel 14 as are the outer spout layer 44 and panel 24. A top edge 55 of the central panel 46 of the inner spout layer 42 abuts an edge 67 of panel 14 at a location vertically between the fold lines 52 and 54 and a top edge 59 of the spout outer layer 44 opposite fold line 54. An upper end portion 47 of the outer layer 44 overlaps the butt joint between edges 55 and 67 to provide additional sealing by making the entry/exit path labyrinthine.

[0030] The left and top sides (as viewed in FIG. 3) of the panel 44 are cut all the way through the thickness of the panel 24, and a crescent shaped hole 57 is cut out at the top of the panel 44 to allow a person to stick their finger or fingernail behind the panel 44 to open it. The right side of the panel 44 (as viewed in FIG. 3) is formed by two fifty-percent cuts 60 and 62, one on the inside surface and one on the outside surface, parallel and spaced apart so that they are offset from one another, as shown in FIGS. 3 and 7. Each cut 60, 62 goes only about halfway through the material thickness. Since the material is not completely broken through at the right side, this holds the spout shut until the package is first opened. When the package is opened by a person sticking their finger or fingernail into the hole 57 to pry open the spout, the material between the inner ends of the two cuts 60 and 62 fractures, permitting opening of the spout, including both the outer panel 44 and the inner layer 42.

[0031] There is a glue spot 36 between the outer surface of the center panel 46 and the inner surface of the outer spout layer 44 which laminates the two layers 44, 46 together. Other glue areas 36 are provided outside of the spout layer 42 between the panels 14 and 24, to seal the carton. Thus, the spout 40 is actually comprised of two paperboard layers, each layer having its own hinge line 52 or 54, and both hinge lines being in registration with one another when the carton is assembled. In spite of the fact that there is a double layer of paperboard, there is sufficient give to permit hinging about the fold lines 52 and 54, although there is a desirable tendency of the carton and memory of the paperboard to hold the spout most of the way shut.

[0032] The flaps 48 and 50 of the inner spout layer 42 are folded inwardly from the central panel 46 and extend from the panel 14 into the inside of the carton, when the spout is shut. Panel 48, as shown in FIG. 6, is spaced from both side walls of the carton, and panel 50 is adjacent to the side wall 20. Panel 50 has a hold-closed notch 64 cut into its upper edge and a hold-open notch 66 also cut into its upper edge. The hold-closed notch 64 engages the upper edge 67 of the hole from which the spout is cut to hold the spout closed, as shown in

FIG. 4. The hold-open notch 66 engages the same edge 67 to hold the spout open, as shown in FIG. 5. A user therefore does not need to hold the spout open as will it hold itself open, and also the spout will hold itself closed when a user closes it. There is sufficient resiliency in the paperboard so that the notches 64 and 66 can withstand repeated openings and closings and still function.

[0033] The side mounting of the spout 40 makes it easier to completely empty the contents of the carton 10. In addition, since the sides of the spout are closed by the flaps 48 and 50, the spout is sift proof, meaning that leakage is very small or non-existent. In addition, when the spout is closed, the front wall of the spout is flush with the interior walls of the carton for easier product loading, which is generally from the top of the carton. The spout having the fifty percent cuts along the laterally inside edge, which may be referred to as being nicked in, also provides a tamper evident seal, while being easy to open.

[0034] Referring to FIGS. 3-5, the paperboard sheet 12 is preferably prefabricated with a lamination or clay coating 70 on one side, such as the top side of the blank shown in FIG. 3, however if not, this side of the paperboard sheet would be coated during pre-assembly using known techniques, such as blade or roller coating techniques. The clay coating can be kaolin or any other suitable clay known in the printing and packaging industry. Preferably, the clay coating includes a whitening agent for the paperboard, such as titanium oxide. The clay coated surfaces of the paperboard sheet 12 are what become the exterior surfaces of the carton after the panels are folded and glued. The clay coating significantly improves the printability of the carton exterior of the carton, which is well-known for achieving a uniform color and finish able to accept printing with minimal distortion. The clay coating also plays a role in reducing the passivity or permeability of the carton, particularly when titanium oxide is part of the coating composition.

[0035] Because a primary purpose for the carton of the present invention is to contain granulated dry goods, including foodstuffs such as powdered milk and coffee, and powdered soap, it is very important that the carton exhibit a

very low MVTR (moisture vapor transmission rate) to reduce the amount of moisture vapor from the ambient environment that infiltrates the interior of the carton. Excessive moisture vapor is undesirable because it can cause early spoilage and clumping of the dry goods. The MVTR of the carton is addressed by coating the paperboard sheet 12 with a vapor impermeable coating 72 on what become the interior surfaces of the walls of the carton 10. This is accomplished by coating the entire underside of the paperboard blank, shown in FIG. 3. When the paperboard sheet is folded and the panels are glued the surfaces of the carton surrounding the resulting interior cavity will be faced with the coating 72. Items contained inside the carton will thus come in direct contact with the coated surfaces. Since the carton can be used to contain foodstuffs, the vapor impermeable coating preferably meets the Federal Drug Administration ("FDA") standards for direct contact with the foodstuffs

[0036] The vapor impermeable coating is selected for its low rate of permeability in addition to its ease of applicability to the paperboard, and in the case of food, its non-toxicity to adjacent food. Certain polymers, such as polyester resins, have been determined to satisfy these parameters and meet FDA requirements for direct contact with food. Cartons with MVTR values of less then 5 are generally considered to exhibit low permeability. The carton of the present invention is preferably designed to exhibit an MVTR of at or near 1.0, and more preferably less than one. The MVTR of the carton is affected primarily by the vapor impermeable coating 72, however, the thickness and composition of the substrate material as well as any other coating, film or foil layers also affect MVTR. Here, the carton's MVTR will thus be determined by the paperboard and the interior 72 and exterior 70 coatings. A preferred vapor impermeable coating is a suitable polymer, such as a polyester resin, for example polyethylene terephthalate ("PET"). While this is the preferred coating, the vapor impermeable coating could also be any other water-dispersible coating. The selected coating composition is preferably water dispersible so that it can be applied to the paperboard using one of several known liquid coating techniques.

[0037] Although other coating techniques can be used, an air knife process is preferred for applying the vapor impermeable coating to the paperboard. The air knife process is preferred here because it has been found to provide a consistent thickness of coating over the coated surface, which is important to achieve a uniform MVTR for each wall of the carton. In the air knife process, the liquid coating is applied to the appropriate side of the paperboard sheet, either before or after being cut into the blank shown in FIG. 3, with a roller and then the rolled-on liquid is dispersed uniformly across the surface of the paperboard by an air stream exiting a jet of the air knife and directed over the surface of the paperboard. This jet air stream levels the coating and blows off excess coating from the paperboard resulting in a uniform coating of the desired thickness.

[0038] As shown in FIG. 8 , the impermeability of the carton could be further enhanced by wrapping it in a foil or polymer layer 80, with or without the clay coating 70. This could also be used to provide a reflective or otherwise eye-catching surface on which to provide graphics. The layer 80 preferably covers the spout 40, and instructions for opening can be provided on the outside of the layer 80 for opening the spout such as "Insert finger here and pull down and forward to open spout", with "here" being at the cut-out 57. The layer 80 may be unadhered to the paperboard material of the container, or may be laminated or otherwise adhered to it.

[0039] Figure 9 shows an unfolded blank for making an alternate paperboard carton having a pour spout centered on an end wall. This embodiment of the invention is nearly identical to the above described embodiment, including the printing and vapor impermeable coatings, with the primary exception of the centered location of the pour spout. As such, the figures of the above described embodiment should be referenced for details not specifically shown in this embodiment. Also, elements in this embodiment similar to those in the above described embodiment will be referenced herein using similar reference numbers, albeit with the suffix "A".

[0040] Referring to FIG. 9, a carton 10A of the invention is folded from a cut and scored one piece, preferably paperboard, sheet blank 12A having panels 14A, 16A, 18A, 20A and 24A. Panels 16A and 20A define opposite side walls of the carton 10A and panel 18A and overlapping panels 14A and 24A define opposite end walls of the carton 10A. Panels 16A, 18A, 20A and 24A each have respective end flaps 28A, 30A, 32A and 34A at their opposite ends and which overlap flaps of the other panels. Like above, when folded, end panel 24A overlaps end panel 14A, with adhesive applied at areas 36A having spaced partial slits on the outside of panel 14A (inside of panel 24A) laminating the two panels together. The flaps 30A and 34A of the end walls are folded beneath the flaps 28A and the flaps 32A are folded down on top of, and adhered to, the flaps 28A.

[0041] At the end wall of the carton 10A that has the pour spout 40A formed in it, the end wall is formed by both end panels 14A and 24A. End panel 14A is the inside panel and end panel 24A is the outside panel. Each panel 14A and 24A has a spout layer cut into it, the inner spout layer formed in panel 14A being identified by 42A, and the outer spout layer 44A being cut into panel 24A. Inner spout layer 42A has a center or main panel 46A and side panels 48A and 50A attached to the sides of the center panel 46A by a fold line 51A or 53A at the corner joint between the center panel 46A and the respective side 48A or side 50A. Center panel 46A is also joined at its base to the remainder of panel 14A by a fold line 52A. Fold line 52A is in registration with fold line 54A which joins the base of outer spout layer 44A to the remainder of the panel 24A.

[0042] Like above, the spout and container form a labyrinth seal (as shown in FIG. 4) such that when the spout 40A is closed the central panel 46A of the inner spout layer 42A is substantially coplanar with the panel 14A as are the outer spout layer 44A and panel 24A. A top edge 55A of the central panel 46A of the inner spout layer 42A abuts the facing edge of panel 14a at a location vertically between the fold lines 52A and 54A and a top edge 59A of the spout

outer layer 44A opposite fold line 54A, so that the upper portion of layer 44A overlaps the butt joint at edge 55A.

[0043] The top side of the panel 44A is cut all the way through the thickness of the panel 24A, and a crescent shaped hole 57A is cut out at the top of the panel 44A to allow a person to stick their finger or fingernail behind the panel 44A to open it. The left and right sides of the panel 44A are each formed by two fifty-percent nick cuts (such as cuts 60 and 62 in FIG. 7), one on the inside surface and one on the outside surface, parallel and spaced apart so that they are offset from one another. Since the material is not completely broken through at the right side, this holds the spout shut until the package is first opened. When the package is opened by a person sticking their finger or fingernail into the hole 57A to pry open the spout, the material between the inner ends of the two nick fractures, permitting opening of the spout, including both the outer panel 44A and the inner layer 42A.

[0044] Like above, a glue spot 36A exists between the outer surface of the center panel 46A and the inner surface of the outer spout layer 44A which laminates the two layers 44A, 46A together. Other partially slit glue areas 36A are provided outside of the spout layer 42A between the panels 14A and 24A, to seal the carton. Thus, the spout 40A is actually comprised of two layers, each layer having its own hinge line 52A or 54A, and both hinge lines being in registration with one another when the carton is assembled. In spite of the fact that there is a double layer of material, since the material is paperboard, there is sufficient give in the material to permit hinging about the fold lines 52A and 54A, although there is a desirable tendency of the carton and memory of the material to hold the spout most of the way shut.

[0045] Like above, the flaps 48A and 50A of the inner spout layer 42A are folded inwardly from the central panel 46A and extend from the panel 14A into the inside of the carton, when the spout is shut. In this embodiment, both panels 48A and 50A are spaced from both side walls 16A and 20A of the carton. Panel 50A has a hold-closed notch 64A cut into its upper edge and a hold-open

notch 66A also cut into its upper edge; the notches function as described above and shown FIGS. 4 and 5.

[0046] Preferred embodiments of the invention have been described in detail above. Many modifications and variations to the described embodiments will be apparent to those skilled in the art. Therefore, the invention should not be limited to these embodiments, but should be defined by the claims which follow.